REMARKS

Applicants have studied the office action mailed November 24, 2003 in connection with the above-identified patent application, and respectfully request consideration of the remarks herein.

Status of the Claims

Applicants thank the Examiner for removing the rejection of claim 66 under 35 U.S.C. § 112 (first paragraph).

Applicants first note that claims 1–18 and 44–68 are pending in the instant application. On the Office Action Summary mailed November 24, 2003, claims 48 and 50 were listed as "objected to", the remainder being rejected. However, upon studying the Examiner's comments, Applicants have noted that claims 2–6 and 66–67 stand rejected under 35 U.S.C. § 112, and that claims 1–16, 18–44 [sic], 49, and 51–67 stand rejected over one or more combinations of cited references under 35 U.S.C. § 103. Accordingly, Applicants request clarification of the status of claims 17, and 45–47, which appear to be neither rejected nor objected to.

Amendments to the Claims

Applicants have amended claims 1, 2, and 66 to more particularly recite that which they consider to be the invention. For reasons that are further discussed hereinbelow, it is believed that the instant amendments do not introduce new matter and, accordingly, entry thereof is respectfully requested.

Rejections under 35 U.S.C. § 112 (¶ 2)

The Examiner has rejected claims 2–6, and 66–67 under 35 U.S.C. § 112 (second paragraph) as allegedly being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Applicants thank the Examiner for re-articulating her position and for suggesting an avenue of approach for Applicants. Specifically, the Examiner has suggested that steps of Applicants' claimed method that pertain to "driving off" unreacted metal complexes and ligand byproducts are more appropriately separated from one another. With the instant Amendment, Applicants amend claims 1, 2, and 66 in a three ways, thereby curing the alleged indefiniteness.

First, the term "optionally" is deleted from claim 1 (in (b)) and 66 (in (d)). In its place, the clause "where present" is inserted, in application to remainder ligand byproducts only. (See (c) of claim 1, and (c) and (e) of claim 66). This clause is also inserted into (e) of claim 2. Thus, each claim now recites that a remainder of ligand byproducts are only driven off in a step separate from the prior exposing step if any such byproducts remain. Support for such an amendment can be found in the specification as filed at page 18, lines 1–6.

Second, claims 2 and 66 are amended to delete a reference to "an unreacted amount of said metal complex", in (e) and (c) respectively. For claim 66, the result is that the unreacted metal complex is not driven off before the second "exposing" in (d).

Third, the preamble of claim 2 is amended so that (d) and (e) occur before the "driving off" in claim 1. Thus, the second "exposing" and "driving off", in claim 2, now occur before the final "driving off" of claim 1 and, because claim 2 no longer recites driving off the unreacted metal complex, the only place in which unreacted metal complex is driven off, is in (c), after all other processes have completed.

Support for the second and third amendments can be found in FIG. 1 of the application as filed, from which, as the Examiner has pointed out, it is clear that unreacted precursor is only driven off after all other steps have been completed.

Accordingly, Applicants believe that the alleged indefiniteness has been cured, and respectfully request that the rejection under 35 U.S.C. § 112 (second paragraph) be removed.

Rejections under 35 U.S.C. § 103(a)

The Examiner has rejected claims 1–4, 7, 11–12, 18–44, 49, 52, and 54–67, under 35 U.S.C. § 103(a) as allegedly being obvious over U.S. Patent No. 5,534,312; to Hill, et al., ("Hill"), in view of U.S. Patent No. 4,199,649, to Yundt ("Yundt"). Applicants respectfully traverse the rejection on the grounds that the Examiner has not made out a *prima facie* case of obviousness.

The Examiner predicates her rejection on her conclusion that Hill teaches photo-chemical deposition of amorphous films and that Yundt supposedly teaches formation of thin films that could be characterized as "mesomorphous", and therefore that Hill and Yundt, together, teach Applicants' claimed invention. Applicants respectfully disagree.

To establish a *prima facie* case of obviousness, all of the claim limitations must be taught or suggested by the prior art. In re Royka, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). Applicants' claims all recite a limitation "driving off an unreacted amount of [the]

metal complex." Neither Hill nor Yundt teach or suggest that unreacted quantities of material should be removed from the film after a photo-chemical reaction.

As discussed in Applicants' specification as filed, although it is "preferred that the precursor metal complex react substantially completely" (page 18, lines 6–7), it is clearly envisaged that complete reaction will not always occur and that, accordingly, "quantities of unreacted precursor metal complex" should be removed (page 18, line 3). Thus, Applicants' claimed invention recites removal of unreacted complex. In contrast, Hill teaches that "byproducts of the photo-induced chemical reaction" should be removed (Hill, at col. 6, lines 25–27) but nowhere contemplates that any unreacted metal complex might remain after the photo-chemical reaction or that such unreacted complex should be removed. Furthermore, Yundt is similarly silent.

Accordingly, the disclosures of Hill and Yundt, when combined, fail to teach or suggest each and every element of Applicants' claimed invention.

Notwithstanding the foregoing, in order to satisfy its burden of establishing a *prima facie* case of obviousness, In re Bell, 26 USPQ2d 1529 (Fed. Cir. 1993), the U.S. Patent and Trademark Office ("PTO") must also establish that there is some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify or combine the reference teachings. In re Rouffet, 149 F.3d 1350, 47 USPQ2d 1453 (Fed. Cir. 1998).

In this case, the Examiner has asserted that, despite Hill's teaching of a photo-resist free method, and irrespective of whether Yundt teaches use or formation of a photo-resist, one of ordinary skill in the art would find Yundt's technology analogous to that of Hill.

However, Applicants have concluded that there are at least four further reasons why one of ordinary skill in the art would not have been motivated to combine the teachings of Yundt with those of Hill, and therefore that Applicants' claimed invention would not have been obvious over the combination of Yundt and Hill.

First, Hill and Yundt teach films whose properties are substantially different from one another. Hill "relates to methods for fabricating patterned films of metals or metal containing compounds on a substrate" (Hill, abstract). In particular, the layers fabricated by Hill are chosen for their conducting properties (see, *e.g.*, Hill, at Col. 1, lines 24–26 "[v]arious electronic devices can be made by depositing thin patterned films of materials having different electrical characteristics on a substrate.").

By contrast, Yundt teaches "coated substrates having particularly desirable surface properties such as low friction coefficients or low contact hysteresis" (Yundt, at col. 1, lines 6–8). Yundt goes on to teach that it is desirable if its coatings can impart properties to the surfaces to which they are attached, including: "lubricity ... anti-stick, ..., anti-wetting, ... or improved resistance to chemical attack" (Yundt, at col. 1, lines 44–56). Such properties are very different in kind from electrical conductivity. Thus, it would be clear to one of ordinary skill in the art that Yundt and Hill are teaching formation of films with markedly different applications and properties, and would not be motivated to combine their respective technologies.

Second, Yundt and Hill differ substantially from one another in the thickness of their respective layers. Yundt teaches formation of a "submicroscopically thin" coating (Yundt, col. 1, line 45) and generally one that is "monomolecularly thin" (see, *e.g.*, Yundt, col. 2, line 8) or, sometimes, a small number of additional layers (Yundt, at col. 8, lines 42–47), though in the case of multiple layers "performance is greatly degraded" (Yundt, col. 8, lines 53–54). Thus, one of ordinary skill in the art, reading Yundt, would understand that it teaches formation of that type of thin film that is best formed from a monolayer of long chain molecules, such as soaps. By contrast, the amorphous films of Hill are of a variety of thicknesses, "from 20 nm to several μm." (Hill, col.4, line 24). Thus, one of ordinary skill in the art, reading Hill, would conclude that Hill's methods admit of layers of variable thickness and are free from the process limitations that are required to prepare a monolayer, as in Yundt. Accordingly, one of ordinary skill in the art would consider that Yundt and Hill were disclosing non-analagous technologies.

Third, the films of Yundt and Hill differ from one another in their respective molecular orientations. Consistent with how the structures of mono-layers are typically understood, Yundt's films comprise long-chained molecules whose axes are oriented parallel to one another, but perpendicular to the substrate, and chemically attached to the substrate at one end of each respective chain. (See the discussion at col. 2 of Yundt, in particular the analogy with "cut pile" and "loop pile" carpets at lines 29–35.) Hill discloses no such structural limitation for its amorphous films. In fact, since Hill's films can be several microns thick, they must generally comprise layers of more than one molecule (for example, "90 monolayers", Hill at col. 4, line 58). Furthermore, one of ordinary skill in the art would not readily be able to conclude that the methods of forming the films of Hill (*e.g.*, spin-coating, see col. 4, lines 37–60) would be apposite to the films of Yundt, which are generally

formed by "dip coating" (Yundt, col. 8, lines 28–29). Accordingly, one of ordinary skill in the art would not consider combining the films of Yundt and Hill because of the limited nature of the molecular orientation of Yundt's films.

Finally, Applicants again respectfully point out that the photo-chemical reactions, where employed by Yundt, are for a distinctly different purpose than those used by Hill. In Yundt, photo-chemical reactions are directed towards selectively binding the polymer molecules of the mono-layer to the substrate, or destroying such a binding (see Yundt, col. 13, lines 46–55). In Yundt, then, the polymer, such as a silicone fluid, is preferentially solubilized or stabilized by such a photochemical reaction; the polymer is not broken down by the photochemical reaction, the reaction does not occur at a metal center, and there is no indication that byproducts of the reaction are subsequently driven off. Thus, the nature and character of the reaction described by Yundt is different from that disclosed by Hill, in which the photochemical reaction decomposes a metal complex to deposit a new metal-containing material on a substrate surface and where byproducts of the reaction are driven off.

Thus, in summary, even assuming that Yundt and Hill, together, taught Applicants' claimed invention (which they do not), Yundt and Hill represent substantially different technologies, so that one of ordinary skill in the art in possession of the teachings of Hill would not have looked to Yundt to find mesomorphous materials suitable for photochemical deposition of metal-containing compounds. In particular, the desired properties of the films of Hill and Yundt are markedly different from one another, the films of Hill and Yundt have very different structural properties, including their respective thicknesses and the orientations of the molecules within them, and the photochemical reactions employed by Hill and Yundt have markedly different applications from one another.

The Examiner has rejected claims 1–11, 13–16, 44, and 51–67, under 35 U.S.C. § 103(a) as allegedly being obvious over Hill in view of U.S. Patent No. 5,348,775, to Lin ("Lin"). The Examiner is thanked for removing claim 12 from the instant rejection. Nevertheless, Applicants again disagree with the Examiner's conclusion regarding the remaining rejected claims, and respectfully request her consideration of the following reasoning.

As previously stated, to establish a *prima facie* case of obviousness, all of the claim limitations must be taught or suggested by the prior art. In re Royka, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). The Examiner concludes that the teaching of mesomorphous films that is absent from Hill can be found in Lin. In particular, the Examiner has stated that metal

complexes used by Lin are "mesomorphous by definition" (November 24, 2003, Office Action, at page 5, last paragraph). Applicants respectfully disagree with this assessment.

The Examiner appears to be basing her conclusion that Lin teaches mesomorphous films, on two references within Lin, to an "acetate/micellar process" (Lin, col. 3, line 21), and to "metallo-organic micellar solutions" (Lin, Col. 4, line 68). However, a closer reading of the context in which the micellar solutions are discussed reveals that it is not the films themselves that are micellar, but instead it is the complex in solution that forms micelles prior to film formation. Lin states that a surfactant is added to "the precursor solution". (Lin, col. 4, lines 65–67.) It is this solution that is described as a "micellar solution". In a further discussion of the effect of surfactants (Lin, col. 6, lines 3–30), it is shown that addition of surfactant to the coating solution "provides for a uniform and adherent film." (Lin, col. 6, line 8). Furthermore, the films cast with solutions containing surfactant are "uniform", and "no appreciable amount" of surfactant remains in the film (Lin, Col. 6, lines 17–27). Thus, Lin does not teach a micellar, or mesomorphous, film, but instead teaches a micellar solution from which a "uniform film" may be deposited in such a way that the micelle-forming constituents are no longer present. Accordingly, since Lin does not teach mesomorphous films, the combination of Hill and Lin does not render Applicants' claimed invention obvious.

Nevertheless, in rejecting claims 1–11, 13–16, 44, and 51–67, the Examiner has also articulated two premises to support her belief that one of ordinary skill in the art would have been motivated to combine the teachings of Lin with those of Hill: first, that Lin allegedly teaches "photopatterning processes" (November 24, 2003, Office Action, at page 5, last paragraph); and, second, that Lin teaches use of iron (Fe), a metal that she states is "homologous" to ruthenium (Ru). Applicants respectfully disagree with both of these premises.

First, regarding Lin's laser patterning process, the Examiner has stated that "it is a photoreaction, involving chemicals (polynuclear complexes with metals) treated via laser light hence is photochemical." (Office Action, November 24, 2003, page 4, last paragraph). Applicants respectfully disagree with the Examiner's characterization of the laser-writing of Lin. First, merely because Lin teaches use of a laser, does not imply that a "photoreaction" is taking place. In fact, throughout Lin, the reaction for creating an oxide deposit is a thermal annealing (see, *e.g.*, Lin, at col. 2, lines 36, 44, and 66, and col. 3, line 59). Where lasers are used to create patterns, it is also by annealing. Thus, in the description of method steps at col.

4, lines 18–35, of Lin, step (d) recites "irradiating the dried spin-coated solid surface with a laser in the desired pattern *to anneal* ..." (emphasis added). Furthermore, in a section that discusses "Laser-writing of PT/PZT Patterns on Si Wafer" at col. 6, lines 32–55 of Lin, there is nothing whatsoever to suggest that a photochemical reaction occurs. Thus, one of ordinary skill in the art in possession of the teachings of Hill would not have been motivated to consider Lin because Lin is not explicitly teaching a photochemical process but instead is clearly teaching a thermal process, the very type of process that Hill teaches away from (see, *e.g.*, Hill, col. 5, lines 35–42).

Second, regarding the alleged "homology" between the iron complexes taught by Lin, and ruthenium complexes, Applicants thank the Examiner for pointing out their oversight of the recitation of "iron" in claim 5 (and also at col. 3, line 28) of Lin. However, Applicants respectfully point out that the use of iron compounds, as disclosed at col. 3, lines 23–27 of Lin, is neither germane to Hill's teaching, nor to Applicants' claimed invention. In Lin, iron is amongst a list of metals whose acetate salts are placed in solution with the ferroelectric material, so that *doped* perovskites can be prepared. (Lin, col. 3, lines 26 and 27, and also claims 5, 4 and 1). Thus, iron is not present in the film of Lin as a complex that undergoes a reaction, either thermal or photochemical, leading to a deposition of a metal containing material. Instead, ions of iron are introduced into the film for the purposes of doping the eventual thin layer. Thus, the references to iron in Lin are clearly non-analogous to the uses of ruthenium contemplated by Applicants. Accordingly, one of ordinary skill in the art, in possession of the teachings of Hill, would not have been motivated to consider iron-containing complexes in Lin for the same purposes as the complexes taught by Hill.

Futhermore, "[h]omology should not be automatically equated with *prima facie* obviousness because the claimed invention and the prior art must each be viewed as a whole" *In re Langer*, 465 F.2d 896, 175 USpQ 169 (CCPA 1972). Thus, Lin, viewed as a whole, would not guide one of ordinary skill in the art to consider ruthenium or its complexes, because the elements that Lin recites have been chosen for a collective set of properties (doping ability) that is irrelevant to the considerations of Hill, and because the elements recited by Lin, as a whole, do not suggest that homology is a factor in their choice. The acetate and carbonate salts of Lin are selected from metal ions that comprise first row transition series (chromium, iron, molybdenum, manganese, and vanadium), lanthanides, (neodymium, europium, praseodymium, ytterbium, and terbium), and a third row transition series element (tungsten), which is not in the same group as any of the other listed metals.

No pair of these metals has a homologous relationship with one another, so that one of ordinary skill in the art would not have concluded that a teaching of iron would automatically render a teaching of ruthenium to be obvious.

Finally, Applicants respectfully point out that, notwithstanding the foregoing, merely because iron and ruthenium are in the same column of the periodic table and occupy adjacent rows in the d-block, one of ordinary skill in the art would not normally expect iron and ruthenium compounds to "have similar chemistry." Citing, for example, to a standard work of inorganic chemistry, *Advanced Inorganic Chemistry — A Comprehensive Text*, F. A. Cotton and G. Wilkinson, 4th Ed., (Wiley, 1980), at p. 912, a copy of which is attached hereto as an Exhibit:

> "[t]he chemistry of ruthenium and osmium bears little resemblance to that of iron except in compounds such as sulfides or phosphides, and in complexes with ligands such as CO, PR_3, η-C_5H_5".

And also, in describing the elements of the first transition series (Sc, Ti, ..., etc.) separately from those in the second and third transition series (Cotton & Wilkinson, at p. 689):

> "[i]n each group (e.g., V, Nb, Ta) the first-series element always differs appreciably from the heavier elements, and comparisons are of limited use."

Thus, iron, from the first transition series, and its compounds would be expected to have different properties from those metals in the second and third transition series, such as ruthenium and osmium.

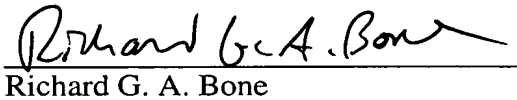
Accordingly, Applicants respectfully submit that claims 1–11, 13–16, 44, and 51–67, are not obvious over Hill in view of Lin, and kindly ask for the rejection to be lifted.

CONCLUSION

In view of the above remarks, Applicants respectfully submit that upon entry of the instant amendment, the subject application is in condition for allowance. Withdrawal of the Examiner's rejections and early notification to this effect are earnestly solicited. If, in the opinion of the Examiner, a telephone conference would expedite the prosecution of the subject application, the Examiner is encouraged to call the undersigned at (650) 493-4935.

The Commissioner is authorized to charge any underpayment or credit any overpayment to Morgan, Lewis & Bockius LLP Deposit Account No. 50-0310 for the appropriate amount. A copy of this sheet is attached.

Respectfully submitted,

Date: March 24, 2004 By: 

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